



NATIONAL RADIO ASTRONOMY OBSERVATORY

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28 December 2011

Before the Federal Communications Commission Washington, D.C. 20554

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|--|---|---------------------|
| In the Matter of |) | |
| |) | |
| Amendment of Sections 15.35 and 15.253 of |) | ET Docket No. 11-90 |
| the Commission's Rules Regarding Operation |) | RM-11555 |
| of Radar Systems in the 76-77 GHz Band. |) | |
| |) | |
| Amendment of Section 15.253 of the |) | |
| Commission's Rules to Permit Fixed |) | ET Docket No. 10-28 |
| Use of Radar in the 76-77 GHz Band. |) | |
| |) | |

A reply to Toyota Motors Comment of 10-25-2011
<http://fjallfoss.fcc.gov/ecfs/document/view?id=7021744808>
by
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Introduction

1. On October 25, 2011, Toyota made an ex parte presentation to the FCC wherein it purported to refute various arguments previously made by the National Radio Astronomy Observatory ("NRAO" or "the Observatory") concerning potential interference to radio astronomy from proposed new rules for operation of 76-77 GHz car radars. Here, NRAO addresses one of the arguments made by Toyota, the preposterous claim that NRAO overestimated the power received at a radio astronomy antenna by 66 dB, resulting in a claimed reduction in the separation distance for non-interfering operation of a vehicular radar from 93 kilometers to 120 meters.

NRAO's calculation of the separation distance was not flawed

2. On slide 2 of Exhibit 2 of its presentation, Toyota cites the fundamental document setting out interference thresholds for radio astronomy, ITU-R Recommendation RA. 769-2. With reference to RA. 769, Toyota claims that the radar signal power received at a radio astronomy antenna is reduced by a factor $1/\sqrt{8 \text{ GHz} \times 2000 \text{ s}}$ beyond that considered by NRAO. This corresponds to -66 dB in the received power and Toyota calculates that this reduces the required separation distance to 120 meters.

3. The factor $1/\sqrt{8 \text{ GHz} \times 2000 \text{ s}}$ describes how the noise in a radiometer receiver decreases with time and bandwidth across 8 GHz over a period of 2000 seconds, corresponding to parameters used in RA. 769: the noise halves with each successive quadrupling of the bandwidth or observing time. ***This behavior pertains to the noise, not to a received signal. The sqrt factor is irrelevant to determining the signal level and has no effect on the power received from one of Toyota's radars.***
4. Indeed, it is the progressive diminution of the noise, while the input signal remains steady, which allows progressively weaker signals to be detected after longer periods of observation. Were the signal to diminish in the manner described by Toyota it would be impossible to detect weaker signals by observing longer and radio astronomy would be a futile endeavor.
5. Therefore, NRAO stands by its original calculation. Moreover, NRAO hopes that Toyota will in the future not further confuse matters by misinterpreting the operations of its prospective victims in the radio astronomy service.

Respectfully submitted,
National Radio Astronomy Observatory



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